SPECIFICATION

[Electronic Version 1.2.8]

Model Submarine Control/Propulsion System

Brief Summary of the Invention

[0001] This is a completely functional 4 ft. (to7 ft or reasonable length) Model Submarine. The working prototype has been developed and is shown in the attached pictures. The application is for the control/propulsion system used to make this submarine functional. The submarine selected for this prototype while resembling the Jules Verne submarine is significantly different. Unlike other model submarines, it does not have a movable rudder, it does not have a propeller, it does not have movable dive planes, and unlike the movie Nautilus, it does not have any rivets, there are no external movable dive planes, rudder, or directional vents, it does however have propulsion jets in the forward and rear sections of the submarine these are fixed jet nozzles. The submarine is a wet hull design, meaning that water is allowed to fill the hull. Water inside the hull is propelled as thrust to various fixed directional jet nozzles. The propulsion jets are powered by bilge pumps. Each bilge pump is responsible for a specific direction e.g. left, right, down, forward. The submarine itself could have been constructed from a PVC pipe 4 ft. to 7ft (or any reasonable dimension) long with tapered ends. The submarine hull shape is not important, (but should be fusiform) rather the use of bilge pumps, ballast adjustment and radio control constitute the subject of this patent application.

[0002] Unlike conventional RC boats and submarines this model has no propeller and no servos. It is entirely jet propelled using internal bilge pumps with fixed jet nozzles, for propulsion and maneuvering. It is unique as a model submarine in that there are no external moving parts. It uses a dynamic ballast system in combination with forward and downward thrust for submerging. In other words the sub must be moving forward in order for it to dive. Otherwise, it has positive buoyancy and will remain on the surface. Buoyancy is achieved with typical trim methods using common insulating foam or other suitable material and either internal or external weights consisting of any suitable material. It turns, submerges, surfaces, and goes forward and reverse without any moving parts. The radio control system is unique as well in that there are no servos or other mechanical control devices, which are easily subject to failure. Electronic controls consist of solid-state electrical switches and automotive type relays.

[0003] The sub submerges when the down pump in front pushes the front end down at a slight angle. In combination with forward thrust the sub will slip under the water at a gradual angle. Releasing the down pump will bring the sub to a level position underwater. Releasing all controls will bring the sub directly to the surface since it is positively buoyant.

[0004] The primary value of the product to a model submarine enthusiast is that the sub is very simple to construct and operate since the only moving parts involved are only the bilge pumps themselves (the turbine in the pump itself rotates to pump the water) and the fact that this submarine will not sink (when the forward thrust is terminated either through loss of signal or by intention). Bilge pumps are readily available, relatively inexpensive and very dependable. They are ideal as miniature turbine units for a model submarine propulsion system.

Detailed Description of the Invention

[0005] The submarine uses a dynamic ballast system for submerging. This means that in order for the sub to submerge it must be moving forward. Also it must be properly trimmed (leveled) using typical model submarine methods consisting of foam and weights. The advantage of this type of system is that the sub will always surface when radio control is terminated. Additionally, forward speed is required to keep the sub underwater. In the event of a radio malfunction, or loss of signal, the sub will surface. As battery power diminishes the submarine slows down losing its ability to stay submerged. Forward thrust and sufficient power is required to submerge sub and keep it cruising underwater. Additional external or internal ballast must be added or removed until proper balance is achieved to submerge the sub. For the additional ballast an external steal bar {about 1/2" diameter and about 6" in length is} can be mounted on the bottom as an adjustment to vary the angle and depth of submergence. Otherwise, without the external or internal ballast, it has positive buoyancy and will remain on the surface. The ballast is used to lower the plane of the sub to allow it to respond to the down submerge controls. Without this ballast the sub remains on the surface. This is useful when only surface control is desired. This can be in situations where the water is shallow or heavily weeded and could constitute an underwater snagging hazard.

[0006] Bilge pumps power the sub. These types of pumps are available at any marine supply store. The bilge pumps are located in the hull with four (can vary) nozzles in the front and two (can vary) in the back. The watertight chamber inside the submarine hull (a PVC pipe sealed at both ends with protruding control wires) contains the radio receiver, solid-state electrical switches, and automotive type relays. This is a short piece of PVC pipe sealed at both hands with only the electrical wires protruding. The relays are controlled by the solid-state switches, which are plugged into the RC receiver. Power from the 12 volt sealed batteries goes into the watertight chamber and

at the control of the operator is directed to the various bilge pumps for model operation. The bilge pumps are either on or off there is no proportional control and none is needed. The solid-state electrical switches are rated at about six (can vary) amps. Automotive relays are added as a safety measure since they can handle 30 amps (can vary) which are far more than the requirement for the bilge pumps. The bilge pumps are either on or off there is no need to reduce voltage with an electronic speed control. The bilge pumps operate on 12 volts DC current (can vary).

[0007] Water continuously enters the sub's hull and the bilge pumps pump it out under pressure providing controlled thrust.

[0008] Once submerged, the sub is self-leveling because of the reduced forward thrust and proceeds underwater at a shallow level of about 6 ft (can vary) or less. If the control for forward thrust is released, the sub will surface because of its positive buoyancy. If both forward and reverse thrust is applied the sub will continue in a forward but slightly up direction since the forward bilge pumps are more powerful than the reverse pump and a the reverse pump tends to raise the forward end up providing a slight incline gradually surfacing.

[0009] Thus there are actually two ways to surface the sub. Either the controls can be completely released and the sub will surface directly, or with both forward and reverse controls on the sub will gradually surface at an incline.

[0010] The forward bilge pump excurrent thrusters or pipes (PVC) located at the rear of the submarine are positioned below the centerline a brass nozzle (s) can be fitted. Thus the forward thrust tends to push up as well as forward thereby slightly tipping the front end of the submarine down. The down bilge pump with its ex current thruster located at the very front of the submarine in combination with the forward thrust and forward tilt down will submerge the submarine. This of course requires proper static balance (trimming) {or} and proper positive buoyancy.

[0011] Approximately 10% (can vary) of the submarine resides {on} above the surface with the remainder below. The proper ballast of submarine is as important as proper bilge pump power, or speed. Battery capacity, affecting ballast, is also important. Without sufficient forward thrust (battery power/bilge pump power) the sub will not have enough power to submerge. Large batteries while supplying sufficient power may be excessively heavy sinking the submarine. The proper balance of all these factors is required for this submarine to work properly in the fashion it does and may vary from sub to sub.

[0012] There are a number of variables that require exact adjustment with this submarine. The speed has to be sufficient to push the submarine underwater to get the speed right the correct size bilge pumps are needed with a sufficient amount of battery power. Too much battery power will weigh too much and too much bilge pump power will cut short the running time. {which now is about 2hrs. After 1.5 hrs the sub will not submerge. All this in turn affects the space inside the 4-foot submarine. In addition to this the correct slope/plane or ballast of the submarine is required. Any one of these adjustments/variables would make the sub work less than favorable if not correct.}